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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)
	10/738,931	VERDYCK, DIRK
	Examiner	Art Unit
	Kandasamy Thangavelu	2123

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 May 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *17 December 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This communication is in response to the Applicants' Response dated May 29, 2007. Claims 1-3, 7-8, 10-12 and 17-19 were amended. Claims 1-23 of the application are pending. This office action is made non-final.

Claim Objections

2. The following is a quotation of 37 C.F.R § 1.75 (d)(1):

> The claim or claims must conform to the invention as set forth in the remainder of the specification and terms and phrases in the claims must find clear support or antecedent basis in the description so that the meaning of the terms in the claims may be ascertainable by reference to the description.

3. Claims 1, 4, 5, 8, 10, 13, 14 and 19 are objected to because of the following informalities:

In claim 1, Lines 9-10, "each of the several printed regions being printed with a different steady state amount of heat energy delivered to the heater elements" appears to be incorrect and it appears that it should be "each of the several printed regions being printed with a different steady state amount of heat energy delivered to the heater elements associated with that region", since each region (such as a rectangular region) will have a set of heater elements associated with it.

In claim 1, Lines 16-17, "the measures of the graphical output as a function of at least the parameter" appears to be incorrect and it appears that it should be "the

measures of the graphical output as the function of at least the parameter", since that function is already mentioned on line 11.

In claim 4, Line 2, "the graphical output function (d_n)" appears to be incorrect and it appears that it should be "the graphical output measure (d_n)", since graphical output is measured using a measure in claim 1, Line 11.

In claim 4, Line 3, "its controlling parameters (E_n, or t_{exc})" appears to be incorrect and it appears that it should be "its controlling parameter (E_n, or t_{exc})".

In claim 5, Line 2, "the graphical output (d_n)" appears to be incorrect and it appears that it should be "the graphical output measure (d_n)", since the same variable (d_n) cannot be used to mean the graphical output measure (function) in claim 4 and the graphical output in claim 5.

In claim 8, Lines 8-10, "each of the several printed regions being printed with a different steady state amount of heat energy (E_n) delivered to the heater elements" appears to be incorrect and it appears that it should be "each of the several printed regions being printed with a different steady state amount of heat energy (E_n) delivered to the heater elements associated with that region", since each region (such as a rectangular region) will have a set of heater elements associated with it.

In claim 8, Lines 16-17, "the measures of the graphical output (d_n) as a function of at least the parameter" appears to be incorrect and it appears that it should be "the

measures of the graphical output (d_n) as the function of at least the parameter", since that function is already mentioned on line 11.

In claim 10, Lines 8-10, "each of the several printed regions being printed with a different constant amount of heat energy delivered to the heater elements" appears to be incorrect and it appears that it should be "each of the several printed regions being printed with a different constant amount of heat energy delivered to the heater elements associated with that region", since each region (such as a rectangular region) will have a set of heater elements associated with it.

In claim 10, Lines 18-21, "printing of an image on a thermographic material using a thermal printing system comprising a thermal printer having a thermal print head incorporating a plurality of energisable heater elements and a heat sink" appears to be incorrect and it appears that it should be "printing of an image on the thermographic material using the thermal printing system comprising the thermal printer having the thermal print head incorporating the plurality of energisable heater elements and the heat sink", since a thermographic material, a thermal printing system, a thermal printer, a thermal print head, a plurality of energisable heater elements and a heat sink are already mentioned in the preamble of the claim.

In claim 13, Line 2, "the graphical output function (d_n)" appears to be incorrect and it appears that it should be "the graphical output measure (d_n)", since graphical output is measured using a measure in claim 10, Line 10.

In claim 13, Line 3, "its controlling parameters (E_n, or t_{exc})" appears to be incorrect and it appears that it should be "its controlling parameter (E_n, or t_{exc})".

In claim 14, Line 2, "the graphical output (d_n)" appears to be incorrect and it appears that it should be "the graphical output measure (d_n)", since the same variable (d_n) cannot be used to mean the graphical output measure (function) in claim 13 and the graphical output in claim 14.

In claim 17, Lines 7-9, "each of the several printed regions being printed with a different constant amount of heat energy (E_n) delivered to the heater elements" appears to be incorrect and it appears that it should be "each of the several printed regions being printed with a different constant amount of heat energy (E_n) delivered to the heater elements associated with that region", since each region (such as a rectangular region) will have a set of heater elements associated with it.

In claim 17, Lines 19-22, "printing of an image on a thermographic material using a thermal printing system comprising a thermal printer having a thermal print head incorporating a plurality of energisable heater elements and a heat sink" appears to be incorrect and it appears that it should be "printing of an image on the thermographic material using the thermal printing system comprising the thermal printer having the thermal print head incorporating the plurality of energisable heater elements and the heat sink", since a thermographic material, a thermal printing system, a thermal printer,

a thermal print head, a plurality of energisable heater elements and a heat sink are already mentioned in the preamble of the claim.

Appropriate corrections are required.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the first paragraph of 35 U.S.C. §112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claims 1, 8, 10 and 17 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

5.1 Claim 1, Lines 11-14 state, "determining a measure of the graphical output as a function of at least a parameter relating to the heat sink temperature for each of the several printed regions measured in a zone of each region where the graphical output was printed in a thermal steady state". The specification does show anywhere a functional relationship between a measure of the graphical output and a parameter relating to the heat sink temperature. Only functional relationships among a measure of the graphical output, the excitation time or energy and the heat

sink temperature (among three variables) are shown. The applicants are directed to point out where this claimed functional relationship between a measure of the graphical output and a parameter relating to the heat sink temperature is shown in the specification.

5.2 Claim 8, Lines 11-14 state, "determining a measure of the graphical output (d_n) as a function of at least a parameter relating to the heat sink temperature for each of the several printed regions measured in a zone of each region where the graphical output (d_n) was printed in a thermal steady state". The specification does show anywhere a functional relationship between a measure of the graphical output and a parameter relating to the heat sink temperature. Only functional relationships among a measure of the graphical output, the excitation time or energy and the heat sink temperature (among three variables) is shown.

5.3 Claim 10, Lines 10-13 state, "determining a measure of the graphical output as a function of at least a parameter related to the heat sink temperature for each of the several printed regions measured in a zone of each region where the graphical output was printed in a thermal steady state". The specification does show anywhere a functional relationship between a measure of the graphical output and a parameter relating to the heat sink temperature. Only functional relationships among a measure of the graphical output, the excitation time or energy and the heat sink temperature (among three variables) are shown.

5.4 Claim 17, Lines 10-13state, "determining a measure of the graphical output (d_n) as a function of at least a parameter related to the heat sink temperature for each of the several printed

regions measured in a zone of each region where the graphical output (d_n) was printed in a thermal steady state". The specification does show anywhere a functional relationship between a measure of the graphical output and a parameter relating to the heat sink temperature. Only functional relationships among a measure of the graphical output, the excitation time or energy and the heat sink temperature (among three variables) is shown.

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claims 1- 5, 7-14 and 16-19 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In Claim 1, Line 11, there is insufficient antecedent basis for " the graphical output ".

In Claim 1, Line 12, there is insufficient antecedent basis for " the heat sink temperature ".

In Claim 1, Lines 13-14, there is insufficient antecedent basis for " the graphical output ".

In Claim 1, Line 16, there is insufficient antecedent basis for " the graphical output ".

In Claim 2, Lines 2-3, there is insufficient antecedent basis for " the heater element ".

In Claim 3, Line 3, there is insufficient antecedent basis for " the graphical output ".

In Claim 4, Line 2, there is insufficient antecedent basis for " the steady state graphical output function ".

In Claim 4, Lines 2-3, there is insufficient antecedent basis for " the used energy ".

In Claim 4, Lines 3-4, there is insufficient antecedent basis for " the graphical output function ".

In Claim 5, Line 2, there is insufficient antecedent basis for " the parameters " and " the graphical output ".

In Claim 7, Line 2, there is insufficient antecedent basis for " the pixels ".

In Claim 8, Line 11, there is insufficient antecedent basis for " the graphical output ".

In Claim 8, Line 12, there is insufficient antecedent basis for " the heat sink temperature ".

In Claim 8, Line 13, there is insufficient antecedent basis for " the graphical output ".

In Claim 8, Line 16, there is insufficient antecedent basis for " the graphical output ".

In Claim 8, Line 17, there is insufficient antecedent basis for " the heat sink temperature ".

In Claim 8, Line 21, there is insufficient antecedent basis for " the value " and " the equation ".

In Claim 9, Line 2, there is insufficient antecedent basis for " the centre ".

In Claim 10, Line 10, there is insufficient antecedent basis for " the graphical output ".

In Claim 10, Line 11, there is insufficient antecedent basis for " the heat sink temperature ".

In Claim 10, Lines 12-13, there is insufficient antecedent basis for " the graphical output ".

In Claim 10, Line 15, there is insufficient antecedent basis for " the graphical output ".

In Claim 11, Lines 2-3, there is insufficient antecedent basis for " the heater element ".

In Claim 12, Line 2, there is insufficient antecedent basis for " the graphical output ".

In Claim 13, Line 2, there is insufficient antecedent basis for " the steady state graphical output function ".

In Claim 13, Lines 2-3, there is insufficient antecedent basis for " the used energy ".

In Claim 13, Lines 3-4, there is insufficient antecedent basis for " the graphical output function ".

In Claim 14, Line 2, there is insufficient antecedent basis for " the parameters " and " the graphical output ".

In Claim 16, Line 2, there is insufficient antecedent basis for " the pixels ".

In Claim 17, Line 10, there is insufficient antecedent basis for " the graphical output ".

In Claim 17, Line 11, there is insufficient antecedent basis for " the heat sink temperature ".

In Claim 17, Lines 12-13, there is insufficient antecedent basis for " the graphical output ".

In Claim 17, Line 15, there is insufficient antecedent basis for " the graphical output ".

In Claim 17, Line 23, there is insufficient antecedent basis for " the heat sink temperature ".

In Claim 17, Line 27, there is insufficient antecedent basis for " the value " and " the equation ".

In Claim 18, Line 2, there is insufficient antecedent basis for " the centre ".

In Claim 19, Line 4, there is insufficient antecedent basis for " the driving ".

In Claim 19, Line 6, there is insufficient antecedent basis for " the driving ".

In Claim 19, Line 9, there is insufficient antecedent basis for " the graphical output ".

In Claim 19, Lines 13-14, there is insufficient antecedent basis for " the graphical output ".

8. Claims 4, 5, 8, 13, 14, 17, 19, 21 and 23 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. This is because these claims use vague and indefinite terms making the claims indefinite.

8.1 Claim 4, Line 2 states, "the steady state graphical output function (d_n)". It is not clear if this is meant to be the "measure of the graphical output" mentioned in claim 1, Line 11. There is no steady state associated with the measure of the graphical output in claim 1. Claim 4, Lines 3-

4 use d_n for "the graphical output function" and not for "the steady state graphical output function"

8.2 In claim 5, Line 2, "the graphical output (d_n)" is mentioned. However, claim 4, Line 2 uses dn for "the steady state graphical output function". It is also not clear if this "the graphical output (d_n)" is same as the "measure of the graphical output" mentioned in claim 1, Line 11.

8.3 Claim 8 uses a long equation in Lines 22 and 23. Several of the variables in the equation are not defined making the claim vague and indefinite.

8.4 Claim 13, Line 2 states, "the steady state graphical output function (d_n)". It is not clear if this is meant to be the "measure of the graphical output" mentioned in claim 10, Line 10. There is no steady state associated with the measure of the graphical output in claim 1. Claim 13, Lines 3-4 use d_n for "the graphical output function" and not for "the steady state graphical output function"

8.5 In claim 14, Line 2, "the graphical output (d_n)" is mentioned. However, claim 13, Line 2 uses dn for "the steady state graphical output function". It is also not clear if this "the graphical output (d_n)" is same as the "measure of the graphical output" mentioned in claim 10, Line 10.

8.6 Claim 17 uses a long equation in Lines 28 and 29. Several of the variables in the equation are not defined making the claim vague and indefinite.

8.7 Claim 19 deals with a control unit for use with a thermal printer for printing an image and therefore is a system or apparatus claim. The claim has been written using one long sentence detailing how it is being used. An apparatus claim should include the use of the apparatus in the preamble and should list all the hardware and software elements in the claim limitations and describe how the elements interact to achieve the function mentioned in the preamble. Any other elements with which the elements of the apparatus interface could be mentioned using the wherein clause. The claim as written does not meet the apparatus claim requirements and therefore is treated as vague and indefinite and is rejected.

8.8 Claim 21 deals with thermal print head provided with a control unit according to claim 19. Since the apparatus claimed in claim 21 is a thermal print head which is a different apparatus than the control unit claimed in claim 19, it cannot be written as a dependent claim of claim 19. It should be written as an independent claim and should list all the hardware and software elements in the claim limitations and describe how the elements interact to achieve the function mentioned in the preamble as the use of the apparatus.

8.9 Claim 23 deals with machine readable data storage device storing the computer program product of claim 22. Since the machine readable data storage device is a product claim, it cannot be written as a dependent claim of the computer program product (which is not patentable under 35 USC 101, see below) but should be written as an independent claim and should list all the

software instructions in the claim limitations and describe how the instructions interact to achieve the function mentioned in the preamble as the use of the program product.

Claim Rejections - 35 USC § 101

9. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

10. Claim 22 is rejected under 35 U.S.C. 101 because the claimed inventions are directed to non-statutory subject matter.

10.1 Claim 22 claims "A computer program product for executing the method as claimed in claim 1 when executed on a computing device associated with a thermal print head". A computer program product is a computer program which is not patentable under 35 USC 101. Only a thermal printing system with the thermal print head and the computer program product for executing some method incorporated in the processor of the thermal print head is patentable.

Claim Interpretations

11.1 In claim 1, Lines 11-14, "determining a measure of the graphical output as a function of at least a parameter relating to the heat sink temperature for each of the several printed regions measured in a zone of each region where the graphical output was printed in a thermal steady state" has been interpreted as "determining a measure of the graphical output as a function of at

least a parameter relating to the thermographic material temperature or print head temperature for each of the several printed regions measured in a zone of each region where the graphical output was printed in a thermal steady state", since the specification does not describe the functional relationship between the measure of the graphical output and the heat sink temperature anywhere.

11.2 In claim 8, Lines 11-14, "determining a measure of the graphical output (d_n) as a function of at least a parameter relating to the heat sink temperature for each of the several printed regions measured in a zone of each region where the graphical output (d_n) was printed in a thermal steady state" has been interpreted as "determining a measure of the graphical output (d_n) as a function of at least a parameter relating to the thermographic material temperature or print head temperature for each of the several printed regions measured in a zone of each region where the graphical output (d_n) was printed in a thermal steady state", since the specification does not describe the functional relationship between the measure of the graphical output and the heat sink temperature anywhere.

11.3 In claim 10, Lines 10-13, "determining a measure of the graphical output as a function of at least a parameter relating to the heat sink temperature for each of the several printed regions measured in a zone of each region where the graphical output was printed in a thermal steady state" has been interpreted as "determining a measure of the graphical output as a function of at least a parameter relating to the thermographic material temperature or print head temperature for each of the several printed regions measured in a zone of each region where the graphical

output was printed in a thermal steady state", since the specification does not describe the functional relationship between the measure of the graphical output and the heat sink temperature anywhere.

11.4 In claims 17, Lines 10-13, "determining a measure of the graphical output (d_n) as a function of at least a parameter relating to the heat sink temperature for each of the several printed regions measured in a zone of each region where the graphical output (d_n) was printed in a thermal steady state" has been interpreted as "determining a measure of the graphical output (d_n) as a function of at least a parameter relating to the thermographic material temperature or print head temperature for each of the several printed regions measured in a zone of each region where the graphical output (d_n) was printed in a thermal steady state", since the specification does not describe the functional relationship between the measure of the graphical output and the heat sink temperature anywhere.

Claim Rejections - 35 USC § 103

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

13. The factual inquiries set forth in Graham v. John Deere Co., 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

14. Claims 1-5, 7, 10-14, 16, 22 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Lukis et al.** (U.S. Patent 5,661,514) in view of **Meeussen et al.** (U.S. Patent 5,664,893), and further in view of **Stephany et al.** (U.S. Patent 5,519,419).

14.1 **Lukis et al.** teaches Method and apparatus for controlling a thermal print head. Specifically, as per Claim 1, **Lukis et al.** teaches a method for generating a mathematical model of thermal printing characteristics of a thermal printing system using a computing device (Fig. 11; CL12, L11-14; CL12, L18-19), the thermal printing system comprising a thermal printer having a thermal head incorporating a plurality of energisable heater elements (CL1, L11-13; CL1, L16-22; CL1, L30-31), and a thermographic material (CL1, L38-39; CL1, L41-43), said method comprising:

- making a reference printout, on the thermographic material, the reference printout comprising several printed regions with each of the several printed regions being printed with a different steady state amount of heat energy delivered to the heater elements (CL1, L31-37).

Lukis et al. does not expressly teach the thermal printing system comprising a thermal printer having a heat sink. **Meeussen et al.** teaches the thermal printing system comprising a thermal printer having a heat sink (CL2, L22-24; Fig. 8). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **Lukis et al.** with the method of **Meeussen et al.** that included the thermal printing system comprising a thermal printer having a heat sink, because the temperature of the heating elements is affected by the temperature of the heat sink; and it is necessary to compute the temperature of the heating elements taking into account the temperature of the heat sink and adjust the applied energy to the heating elements based on the estimated temperature of the heating elements (CL2, L40-47).

Lukis et al. teaches a measure of the graphical output as a function of at least a parameter related to the (heat sink) thermographic material temperature for each of the several printed regions measured in a zone of each region where the graphical output was printed in a thermal steady state (CL7, L60 to CL8, L8; Fig. 5; Fig. 6 and Fig. 7). **Lukis et al.** and **Meeussen et al.** do not expressly teach determining a measure of the graphical output as a function of at least a parameter relating to the heat sink temperature for each of the several printed regions measured in a zone of each region where the graphical output was printed in a thermal steady state. **Stephany et al.** teaches determining a measure of the graphical output as a function of at least a parameter relating to the heat sink temperature for each of the several printed regions measured in a zone of each region where the graphical output was printed in a thermal steady state (CL6, L62 to CL7, L10). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **Lukis et al.** and **Meeussen et al.** with the method of **Stephany et al.** that included determining a measure of the graphical output as a function of at

least a parameter relating to the heat sink temperature for each of the several printed regions measured in a zone of each region where the graphical output was printed in a thermal steady state, because that would allow a series of calculations to be carried out in a self-calibrating system capable of producing spots under given initial conditions with changing temperature of the thermographic material or heating elements in the course of the printing process (CL6, L62-67); to use the information to develop a plurality of relationships between the temperature of then print head and the measured density of the test patch (CL7, L9-10); and use the relationships in the course of actually printing a desired image on a print sheet by measuring the temperature of the print head , feeding the temperatures continuously into a selected function to obtain necessary pulse duration to the heating elements (CL7, L28-34).

Lukis et al. teaches establishing the mathematical model as a function of at least the parameter related to the temperature of the thermographic material and the steady state amounts of heat energy (CL12, L11-14; CL12, L18-19; CL7, L60 to CL8, L8; Fig. 5; Fig. 6 and Fig. 7). **Lukis et al.** and **Meeussen et al.** do not expressly teach establishing the mathematical model by determining a best fit relationship between the measures of the graphical output as a function of at least the parameter related to the heat sink temperature and the steady state amounts of heat energy. **Stephany et al.** teaches establishing the mathematical model by determining a best fit relationship between the measures of the graphical output as a function of the steady state amounts of heat energy (CL7, L11-13; CL7, L40-47).

Lukis et al. and **Stephany et al.** do not expressly teach establishing the mathematical model by determining a best fit relationship between the measures of the graphical output as a function of at least the parameter related to the heat sink temperature. **Meeussen et al.** teaches

establishing the mathematical model by determining a relationship between the heating element temperature as a function of at least the parameter related to the heat sink temperature (CL2, L40-47).

Per Claim 2: **Lukis et al., Meeussen et al.** and **Stephany et al.** teach the method according to claim 1. **Lukis et al.** teaches that the heat energy is represented by a given equivalent time ($t_{exc,}$) used for powering the heater element with an equivalent constant power (P_0), E_n=t_{exc}*P_0 (CL2, L11-13; CL10, L53-61; Fig. 5; Fig. 7; CL7, L53-59; CL7, L60 to CL8, L8).

Per Claim 3: **Lukis et al., Meeussen et al.** and **Stephany et al.** teach the method according to claim 1. **Lukis et al.** and **Meeussen et al.** do not expressly teach while making the reference printout, logging of parameters that are determinative to the graphical output. **Stephany et al.** teaches while making the reference printout, logging of parameters that are determinative to the graphical output (CL6, L62 to CL7, L10).

Per Claims 4 and 5: **Lukis et al., Meeussen et al.** and **Stephany et al.** teach the method according to claim 1. **Lukis et al.** teaches establishing a table (T) of data comprising the steady state graphical output function (d_n), and the used energy (E_n or t_{exc}), giving an implicit relationship between the graphical output function (d_n) and its controlling parameters (E_n, or t_{exc}); and the parameters (P_n) (Parameters are assumed to be same as controlling parameters in claim

4) that are determinative to the graphical output (d_n) (Fig. 11, Item 108; CL10, L12-16; CL11, L12-15; Fig. 12; CL11, L21-33; CL11, L40-44; CL10, L53-61; CL2, L11-13).

Per Claim 7: **Lukis et al., Meeussen et al.** and **Stephany et al.** teach the method according to claim 1. **Lukis et al.** teaches that a printing pattern of the reference printout is selected so that the pixels being printed do not interact with each other (CL1, L16-29).

14.2 As per Claim 10, **Lukis et al.** teaches a method for driving a thermal print head of a thermal printing system (Fig. 11; CL12,Abstract, L4-6; CL1, L11-13; CL1, L16-22; CL1, L31-37), comprising a thermal printer having a thermal head incorporating a plurality of energisable heater elements (CL1, L11-13; CL1, L16-22; CL1, L30-31), and a thermographic material (CL1, L38-39; CL1, L41-43), said method comprising:

in a first mode establishing a mathematical model (Fig 11; CL12, L11-14; CL12, L18-19) by:

- making a reference printout on the thermographic material, the reference printout comprising several printed regions with each of the several printed regions being printed with a different constant amount of heat energy delivered to the heater elements (CL1, L31-37).

Lukis et al. does not expressly teach the thermal printing system comprising a thermal printer having a heat sink. **Meeussen et al.** teaches the thermal printing system comprising a

thermal printer having a heat sink (CL2, L22-24; Fig. 8). the heating elements based on the estimated temperature of the heating elements (CL2, L40-47).

Lukis et al. teaches a measure of the graphical output as a function of at least a parameter related to the (heat sink) thermographic material temperature for each of the several printed regions measured in a zone of each region where the graphical output was printed in a thermal steady state (CL7, L60 to CL8, L8; Fig. 5; Fig. 6 and Fig. 7). **Lukis et al.** and **Meeussen et al.** do not expressly teach determining a measure of the graphical output as a function of at least a parameter relating to the heat sink temperature for each of the several printed regions measured in a zone of each region where the graphical output was printed in a thermal steady state. **Stephany et al.** teaches determining a measure of the graphical output as a function of at least a parameter relating to the heat sink temperature for each of the several printed regions measured in a zone of each region where the graphical output was printed in a thermal steady state (CL6, L62 to CL7, L10).

Lukis et al. teaches a establishing the mathematical model as a function of at least the parameter related to the temperature of the thermographic material and the steady state amounts of heat energy (CL12, L11-14; CL12, L18-19; CL7, L60 to CL8, L8; Fig. 5; Fig. 6 and Fig. 7). **Lukis et al.** and **Meeussen et al.** do not expressly teach establishing the mathematical model by determining a best fit relationship between the measures of the graphical output and the constant amounts of heat energy. **Stephany et al.** teaches establishing the mathematical model by determining a best fit relationship between the measures of the graphical output and the constant amounts of heat energy (CL7, L11-13; CL7, L40-47).

Lukis et al. teaches in a second mode determining a heat energy to be supplied to at least one energisable heater element in accordance with the mathematical model for printing of an image on a thermographic material using a thermal printing system (CL11, L21-33; CL11, 40-44; CL12, L11-14; CL12, L18-22), comprising a thermal printer having a thermal print head incorporating a plurality of energisable heater elements (CL1, L11-13; CL1, L16-22; CL1, L30-31).

Lukis et al. and **Stephany et al.** do not expressly teach the thermal printing system comprising a thermal printer having a heat sink; and a current value of the parameter related to the heat sink temperature. **Meeussen et al.** teaches the thermal printing system comprising a thermal printer having a heat sink (CL2, L22-24; Fig. 8); and a current value of the parameter related to the heat sink temperature (CL2, L40-47).

14.3 As per Claims 11-14 and 16, these are rejected based on the same reasoning as Claims 2-5 and 7, supra. Claims 11-14 and 16are method claims having the same limitations as Claims 2-5 and 7, except they depend on claim 10. Therefore, they are taught throughout by **Lukis et al., Meeussen et al.** and **Stephany et al.**

Per Claim 22: **Lukis et al., Meeussen et al.** and **Stephany et al.** teach the method according to claim 1. **Lukis et al., Meeussen et al.** and **Stephany et al.** teaches computer program product for executing the method as claimed in claim 1 when executed on a computing device associated with a thermal print head (**LU**: Fig 11).

Per Claim 23: **Lukis et al., Meeussen et al.** and **Stephany et al.** teach the computer program product of claim 22. **Lukis et al.** teaches a machine readable data storage device storing the computer program product (**LU**: Fig 11).

15. Claims 6 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Lukis et al.** (U.S. Patent 5,661,514) in view of **Meeussen et al.** (U.S. Patent 5,664,893), and further in view of **Stephany et al.** (U.S. Patent 5,519,419) and **Carnahan et al.** ("Applied Numerical Methods", John Wiley and Sons, 1969).

15.1 As per Claim 6, **Lukis et al., Meeussen et al.** and **Stephany et al.** teach the method according to claim 1. **Lukis et al.** and **Meeussen et al.** do not expressly teach that the best fit relationship is a parametrisable function (f()), being defined by a set of unknown coefficients (a,b,c,d,...) found using a curve fitting process on the table (T). **Stephany et al.** teaches that the best fit relationship is a parametrisable function (f()) (CL7, L11-13; CL7, L20-27).

Lukis et al., Meeussen et al. and **Stephany et al.** do not expressly teach that the best fit relationship is a parametrisable function (f()), being defined by a set of unknown coefficients (a,b,c,d,...) found using a curve fitting process on the table (T). **Carnahan et al.** teaches that the best fit relationship is a parametrisable function (f()), being defined by a set of unknown coefficients (a,b,c,d,...) found using a curve fitting process on the table (T) (Page 1, CL2, Para 2 to Page 3, CL1, Para 2). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **Lukis et al., Meeussen et al.** and **Stephany et al.** with the method of **Carnahan et al.** that included the best fit relationship being a

parametrisable function (f()), being defined by a set of unknown coefficients (a,b,c,d,...) found using a curve fitting process on the table (T), because the most common approximating functions relating input and output variables of experiments stored in tables are linear combinations of functions drawn from a class of functions $g(x) = a_0 x + a_1 x + a_2 x^2 + \ldots + a_n x^n$ (Page2, CL1, Para 1; CL2, Para 1; the a_0, a_1, a_2 and a_n correspond to unknown coefficients (a,b,c,d,...)); such an approximating function can give good approximation for the actual function f(x) between the input and output variables of an experiment; and the error in the approximation can be made arbitrarily small (Page 3, CL1, Para 2).

15.2 As per Claim 15, it is rejected based on the same reasoning as Claim 6, supra. Claim 15 is a method claim having the same limitations as Claim 6, except it depends on claim 10. Therefore, it is taught throughout by **Lukis et al., Meeussen et al., Stephany et al.** and **Carnahan et al.**

16. Claims 9 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Lukis et al.** (U.S. Patent 5,661,514) in view of **Meeussen et al.** (U.S. Patent 5,664,893), and further in view of **Stephany et al.** (U.S. Patent 5,519,419) and **Haraguchi et al.** U.S. Patent 6,002,498).

16.1 As per Claim 9, **Lukis et al., Meeussen et al.** and **Stephany et al.** teach the method according to claim 1. **Lukis et al., Meeussen et al.** and **Stephany et al.** do not expressly teach that said graphical output (d_n) is a pixel with a certain colour spectral density in the centre of the pixel and/or a pixel with a certain size defined by a perimeter having a given colour spectral

density, to be reproduced on said thermographic material (10). **Haraguchi et al.** teaches that said graphical output (d_n) is a pixel with a certain colour spectral density in the centre of the pixel and/or a pixel with a certain size defined by a perimeter having a given colour spectral density, to be reproduced on said thermographic material (10) (CL13, L44-54). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **Lukis et al., Meeussen et al.** and **Stephany et al.** with the method of **Haraguchi et al.** that included said graphical output (d_n) is a pixel with a certain colour spectral density in the centre of the pixel and/or a pixel with a certain size defined by a perimeter having a given colour spectral density, to be reproduced on said thermographic material (10), because that would allow obtaining a conversion function between analytical density representing an amount of dye from spectral densities of a color image; and the color reproducibility of a color image can be improved by reading a color image using an image reading apparatus and making a print on an image forming apparatus from the spectral density of the color image read by the image reading apparatus (CL1, L10-19).

16.2 As per Claim 18, it is rejected based on the same reasoning as Claim 9, supra. Claim 18 is a method claim having the same limitations as Claim 9, except it depends on claim 10. Therefore, it is taught throughout by **Lukis et al., Meeussen et al., Stephany et al.** and **Haraguchi et al.**

17. Claims 19-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Lukis et al.** (U.S. Patent 5,661,514) in view of **Stephany et al.** (U.S. Patent 5,519,419).

17.1 As per Claim 19, **Lukis et al.** teaches a control unit for use with a thermal printer for printing an image onto a thermographic material (Fig. 11; Fig. 12; Abstract, L4-6; CL1, L11-13; CL1, L31-37; CL1, L38-39; CL1, L41-43), the thermal printer having a thermal head incorporating a plurality of energisabe heater elements (CL1, L18-22; CL1, L30-31),

the control unit being adapted to control the driving of the thermal printer so as to make a reference printout on the thermographic material (CL1, L31-37), the reference printout consisting of several printed regions (CL1, L31-37), the driving of the thermal printer being such that each of the several printed regions is printed with a different constant amount of heat energy delivered to the heater elements (CL1, L31-37); and

the control unit furthermore being adapted to determine a measure of the graphical output for each of the several printed regions measured in a zone of each region where the graphical output was printed in a thermal state (CL7, L60 to CL8, L8; Fig. 5; Fig. 6 and Fig. 7).

Lukis et al. teaches the control unit furthermore being adapted to establish a mathematical model of thermal printing characteristics (CL12, L11-14; CL12, L18-19; CL7, L60 to CL8, L8; Fig. 5; Fig. 6 and Fig. 7). **Lukis et al.** and **Meeussen et al.** do not expressly teach the control unit furthermore being adapted to establish a mathematical model of thermal printing characteristics by determining a best fit relationship between the measures of the graphical output and the constant amounts of heat energy. **Stephany et al.** teaches the control unit furthermore being adapted to establish a mathematical model of thermal printing characteristics

by determining a best fit relationship between the measures of the graphical output and the constant amounts of heat energy (CL7, L11-13; CL7, L40-47).

Per Claim 20: **Lukis et al.** and **Stephany et al.** teach the control unit according to claim 19. **Lukis et al.** teaches the control unit furthermore being adapted for determining a heat energy to be supplied to at least one energisable heater element in accordance with the mathematical model (CL11, L21-33; CL11, 40-44; CL12, L11-14; CL12, L18-22).

Per Claim 21: **Lukis et al.** and **Stephany et al.** teach the control unit according to claim 19. **Lukis et al.** teaches thermal print head provided with a control unit (CL1, L18-22; CL1, L30-31).

Applicants arguments

18. As per applicant's argument that "Verdyck is not a prior art because the Verdyck application was not published more than one year prior to the U.S. filing date of the present application; the Verdyck application is not by another", the Examiner has used new references **Lukis et al.** (U.S. Patent 5,661,514), **Meeussen et al.** (U.S. Patent 5,664,893), **Stephany et al.** (U.S. Patent 5,519,419) and **Carnahan et al.** ("Applied Numerical Methods", John Wiley and Sons, 1969) in making art rejections in this Office action. Additional claim rejections under 35 USC 112 First Paragraph, 35 USC 112 Second Paragraph and 35 USC 101 and claim objections are included in this office action.

Conclusion

19. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Kandasamy Thangavelu whose telephone number is 571-272-3717. The examiner can normally be reached on Monday through Friday from 8:00 AM to 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Rodriguez, can be reached on 571-272-3753. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to TC 2100 Group receptionist: 571-272-2100.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

K. Thangavelu
Art Unit 2123
July 7, 2007